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EXAMINER

VIGUSHIN, JOHN B

ART UNIT

PAPER NUMBER

2827

DATE MAILED: 03/13/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/814,486

Applicant(s)

LI, DELIN

Examiner

John B. Vigushin

Art Unit

2827

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 20 March 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-5 and 7 is/are allowed.
- 6) ☒ Claim(s) 8-20 is/are rejected.
- 7) ☒ Claim(s) 6 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2. 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Drawings***

1. The Drawings filed on March 20, 2001 have been approved by the Official Draftsman.

***Specification***

2. The disclosure is objected to because of the following informalities:  
In the Specification, p.13, line 21: "thereby forming a pre-circuit assembly 57" appears to be an error because there is no reference number 57 in the Drawings. The Examiner believes the above-cited passage should be deleted.

Appropriate correction is required.

***Claim Objections***

3. Claims 1, 6, 14 and 19 are objected to because of the following informalities:

In Claim 1 (see Spec., p.20, line 1): "a" should be changed to --at--.

In Claim 14 (see Spec., p.25, line 6: insert --one-- before "second".

In Claim 19, line 3: "a" should be changed to --at--.

Claim 6 recites the identical subject matter and has the same claim dependency (base Claim 1) as Claim 5. Therefore, Claim 6 is redundant and should either be amended to distinguish from Claim 5, or, be cancelled.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 8-20 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

A) Claim 8 recites that "said dielectric material is applied upon said first interior surface." This limitation has no support in the Specification. The dielectric material in base Claim 1 (Specification, p.20, lines 3-4) and referenced by Claim 8 is explicitly disclosed as "not received within the apertures 18 or 20" (Specification, p.13, lines 4-6), said aperture 18 (corresponding to the "first aperture" of Claim 8) comprising the "first interior surface" recited in Claim 8 (see Figs. 1A and 1B; Specification, p.9, lines 15-20).

B) Claim 9 recites "removing a portion of said core member, thereby forming at least one electrically conductive air bridge **by use of said second electrically conductive member**" (bold emphasis by the Examiner) in lines 15-17. This limitation is non-enabling since the "second electrically conductive member is already coupled to the "layer of dielectric material" (lines 13-14 of Claim 9) and therefore cannot function as the "air bridge." Another conductive member on the side of the core opposite to the side carrying the "second electrically conductive

member" is required to form said "air bridge" upon removal of a portion of said "core" (See Figs. 1D and 1E in supporting disclosure). Thus, Claim 9 recites insufficient structure for forming the "air bridge."

C) Claim 14 recites "thereby forming at least one first air-bridge within said first pre-circuit assembly and at least one second air-bridge within said second circuit assembly" in paragraph 9 (see Specification, p.24, lines 18-20 (*Examiner's Note: The Examiner counts the paragraphs of the claim beginning with the first paragraph after the preamble of the claim*)). However, the disclosure does not support this. In fact, the first and second air-bridges are formed in the **second** and **third** pre-circuit assemblies claimed in Claim 14 and supported in the disclosure (Fig. 1A corresponds to the first pre-circuit assembly and Figs. 1D, 1E and 1F show the air-bridges formed in the second and third pre-circuit assemblies, respectively). Accordingly, the following amendment is recommended to cure this defect:

- i) In paragraph 9 (Spec., p.24, line 19), change "first" to --second--.
- ii) In paragraph 9, (Spec., p.24, line 20), change "second circuit" to --third pre-circuit--.

D) Claim 14 further recites:

- i) "a certain solder mask material" in paragraph 10 (Spec., p.24, line 21).
- ii) "said solder mask material" in paragraph 11 (Spec., p.25, lines 1-2), in paragraph 12 (Spec., p.25, lines 12-13), in paragraph 13 (Spec., p.25, lines 17-19), and in paragraph 14 (Spec., p.25, lines 20-22).
- iii) "a second dielectric material" in paragraph 14 (Spec., p.25, line 20).

E) Claim 18 recites "said solder mask material" in line 1.

F) Claim 19 recites "said solder mask material" in lines 2, 3-4 and 8.

G) Claim 20 recites "a second dielectric material" in line 2, "said second dielectric material" in lines 2-3 and "said solder mask material" in line 4.

H) The above-cited recitations of the "solder mask material" and the "second dielectric material" in Claims 14, 18-20 (as indicated above in sections D, E, F and G) are non-enabled by the disclosure for the following reasons:

i) In base Claim 14, paragraph 10 (Spec., p.24, line 1), the recitation of "a certain solder mask" is not supported by the disclosure, wherein it is a dielectric material, **not the solder mask** material, that is applied on the second and third pre-circuit assemblies to cover the conductive members and underfill the air-bridges. Furthermore, in paragraph 14 (Spec., p.25, lines 20-23) the recitations of and relationship between "a second dielectric material" and the "solder mask material" are not supported by the disclosure, wherein it is a solder mask material (**not a second dielectric material** as recited in above-cited paragraph 14, line 20) selectively applied upon exposed portions of the second dielectric material (**not the solder mask material** as recited in paragraph 14, lines 21-22) and upon certain portions of the electrically conductive material recited in base Claim 14. Claims 18-20 suffer the same defect as in Claim 14 of reversing the roles of the "second dielectric material" and the "solder mask material." Accordingly, the above-cited defect may be cured by the following recommended amendments:

ii) In Claim 14:

Paragraph 10 (Spec., p.24, line 21), change "certain solder mask" to --second dielectric--.

Paragraph 11 (Spec., p.25, lines 1-2), change "solder mask" to --second dielectric--.

Paragraph 12 (Spec., p.25, line 12), change "solder mask" to --second dielectric--.

Paragraph 13 (Spec., p.25, lines 18 and 19), change "solder mask" to --second dielectric--.

Paragraph 14 (Spec., p.25, line 20), change "second dielectric" to --solder mask--.

Paragraph 14 (Spec., p.25, line 21), change "solder mask" to --second dielectric--.

iii) In Claim 18, line 1, change "solder mask" to --second dielectric--.

iv) In Claim 19:

Line 2, change "solder mask" to --second dielectric--.

Line 3, change "solder mask" to --second dielectric--.

Line 8, change "solder mask" to --second dielectric--.

v) In Claim 20:

Line 2, change "second dielectric" to --solder mask--.

Line 3, change "second dielectric" to --solder mask--.

Line 4, change "solder mask" to --second dielectric--.

I) Claims 10-13 depend from base Claim 9 and therefore inherit the defects of the base claim.

J) Claims 15-20 depend from base Claim 14 and therefore inherit the defects of the base claim.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 9-13 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A) Claim 9 recites the limitation "said dielectric layer" in line 10 and the limitation "said layer of dielectric material" in line 14. There is insufficient antecedent basis for each of these limitations in the claim. This rejection may be overcome by the following recommended amendments:

- a. In line 10: change "said dielectric material" to --a first layer of dielectric material--.
- b. In line 14: change insert --first-- after "said".
- c. In line 18: delete "said".
- d. In line 21: after "of" delete "said".
- e. The following changes in Claim 13 are recommended in order to be consistent with the above changes in base Claim 9 and prevent other 35 USC § 112, 2<sup>nd</sup> paragraph problems in Claim 13:

i) Claim 13, line 7: before "dielectric" insert --first layer of--.



ii) Claim 13, line 9: before "dielectric" delete "said".

B) Claim 20 recites the limitation "said at least one aperture" in lines 3-4. There is insufficient antecedent basis for this limitation in the claim. In view of the proposed amendments in conjunction with the above-mentioned 35 USC § 112, 1<sup>st</sup> paragraph defects in Claims 14, 19 and 20, the following additional amendment to Claim 20 may overcome said 35 USC § 112, 2<sup>nd</sup> paragraph antecedent basis defect:

i) In line 3, delete "at least one".

ii) In line 4, change "aperture" to --apertures--.

iii) In order to provide the antecedent basis in base Claim 14 for the above-recommended amendments to Claim 20, the following amendments to base Claim 14 are recommended:

a) In paragraph 11 (Spec., p.25, line 1): insert --forming apertures by--before "selectively".

b) In paragraph 11 (Spec., p.25, line 2): delete "effective to" and replace it with --wherein said apertures--.

C) Claim 10-13 depend from base Claim 9 and therefore inherit the defects of the base claim.

***Allowable Subject Matter***

8. Claims 1-5 and 7 have been allowed.

9. Claims 8-20 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 1<sup>st</sup> and 2<sup>nd</sup> paragraphs, set forth in this Office action.

The following is a statement of reasons for the indication of allowable subject matter:

As to Claims 1-5, 7 and 8, patentability resides, at least in part, in a *layer of dielectric material applied to at least the first circuit assembly and at least a sixth electrically conductive member disposed within the layer of dielectric material*, in combination with the other limitations of base Claim 1.

As to Claims 9-13 (as best understood by the Examiner in light of the 35 USC § 112, 1<sup>st</sup> and 2<sup>nd</sup> paragraph defects set forth above), patentability appears to reside, at least in part, in *placing a second layer of dielectric material upon the first assembly, placing a third electrically conductive member upon the second layer of dielectric material and coupling the third electrically conductive member to the air-bridge*, in combination with the other limitations of base Claim 9.

As to Claims 14-20 (as best understood by the Examiner in light of the 35 USC § 112, 1<sup>st</sup> and 2<sup>nd</sup> paragraph defects set forth above), patentability appears to reside, at least in part, in *forming apertures by selectively removing certain portions of the second dielectric material, wherein the apertures selectively expose certain portions of the at least one second, at least one fourth, and at least one fifth electrically conductive members and the at least one first air-bridge and the at least one second air-bridge*, in combination with the other limitations of base Claim 14.

10. As allowable subject matter has been indicated, applicant's reply must either comply with all formal requirements or specifically traverse each requirement not complied with. See 37 CFR 1.111(b) and MPEP § 707.07(a).

### ***Conclusion***

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a) Goenka et al. (US 6,217,783 B1) discloses a multilayer board comprising a first electrically conductive member (core 10) with metallization 32 thereon forming the circuit pattern and metallization 52 plated on circuit pattern metallization 32 providing the fortifying metal layer. Figs. 3A-3J show the process of plating and etching that results in the final product in Fig. 3J. The pre-circuit assembly of Fig. 3H is mounted on an insulating substrate 60 by means of adhesive layer 61 (col.4: 17-25) and portions of the core 10 are then etched to form pedestals that support the air-bridges 90 and 99. The fortifying layers 52 and 54 of the circuit assembly in Fig. 3H enable the formation of T-shaped (or similarly shaped) air-bridges that are resistant to mechanical stresses caused by bending, flexure, differences in thermal expansion coefficients among the parts of the system circuit, etc. (col.3: 5-19). Goenka et al. does not teach encapsulating the etched circuit assembly of Fig. 3H in Fig. 3J with a dielectric filler; air is used as the dielectric in Fig. 3J.

b) Potter et al. (US 4,899,439) discloses a multilayer circuit including an air-bridge (air dielectric) structure (Fig. 13) or backfilling the empty space with a material dielectric 102 (Fig. 14) (col.5: 48-52; col.6: 3-22).

c) Yee (US 4,920,639) discloses a multilayer crossover (air-bridge) interconnect structure (Figs. 12 and 13). No dielectric material encapsulates or supports the crossover conductors.

d) Thomas et al. (US 5,117,276) discloses a crossover circuit comprising an air-bridge structure (Fig. 1M; col.9: 8-17) and an alternative crossover circuit wherein the crossover conductors are supported by metal filler 54 that enhances the mechanical strength of the structure (Fig. 2B; col.9: 46-51).

e) Bothra et al. (US 5,798,559) discloses an air-bridge interconnect circuit (Fig. 4) wherein the air-bridge serves to reduce cross-talk between the circuit lines (col.8: 60-63).

f) Degani et al. (US 6,160,715) discloses apertures (vias 47-50) formed through dielectric layers 31a-34a and plated with conductive metal for selectively establishing electrical connections with conductive levels 31-34.

g) The following references disclose crossover circuits supported by a dielectric material providing electrical insulation and/or physical support for the crossover conductor:

i) Marcantonio (US 4,000,054): Fig. 1.

ii) Pfahnl et al. (US 4,118,595) : Fig. 5.

iii) Berry et al. (US 4,141,055) : Figs. 4 and 9 (col.3: 31-38; col.4: 21-27).

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B. Vigushin whose telephone number is 703-308-

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1205. The examiner can normally be reached on Monday to Friday from 8:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Talbott, can be reached on (703) 305-9883. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Jbv  
March 08, 2002



John B. Vigushin  
Examiner  
Art Unit 2827